

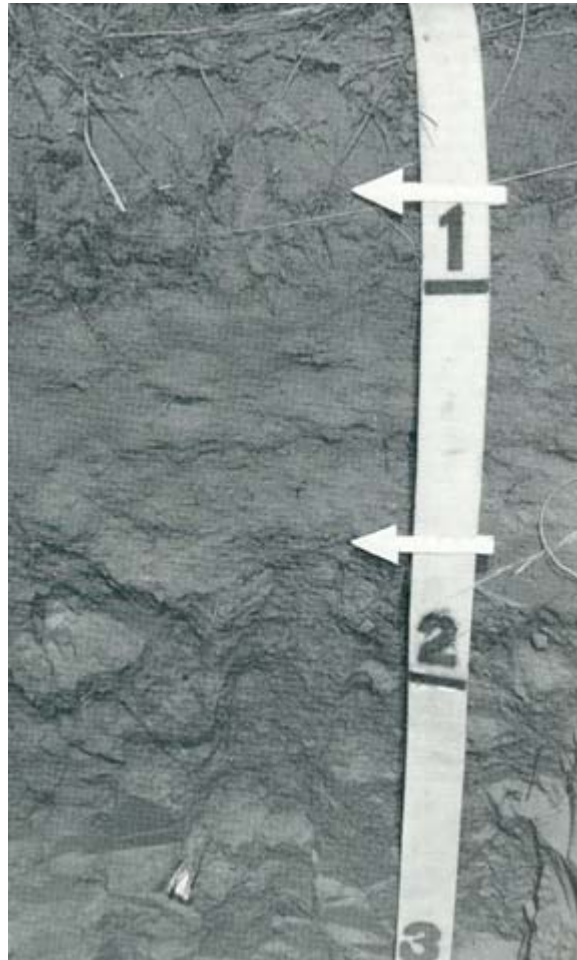
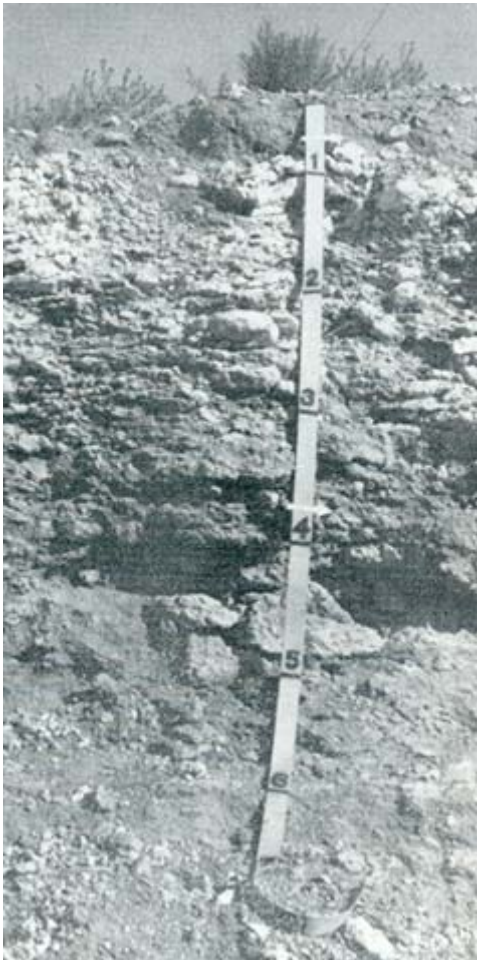
An aerial photograph showing a large-scale agricultural operation. In the center, there are several large, rectangular, green-colored storage ponds or lagoons, likely for manure. To the right of these, there are several long, narrow, brown-colored storage areas, possibly for silage or other feed. The surrounding landscape is a mix of green fields and dry, yellowish-brown soil. The text is overlaid on the image.

Cropping Schemes for Utilizing Manure Nutrients

Strategies Nitrogen Removal
Robert Flynn, Associate Professor
New Mexico State University
rflynn@nmsu.edu

Selecting the Right Crop

- Adapted to soils of the region



Selecting the Right Crop

- Adapted to soils of the region





Better Soil, Better Crop



Agronomic Must Soil Test

Ace Hardware

Ace is America's Place
for helpful service!

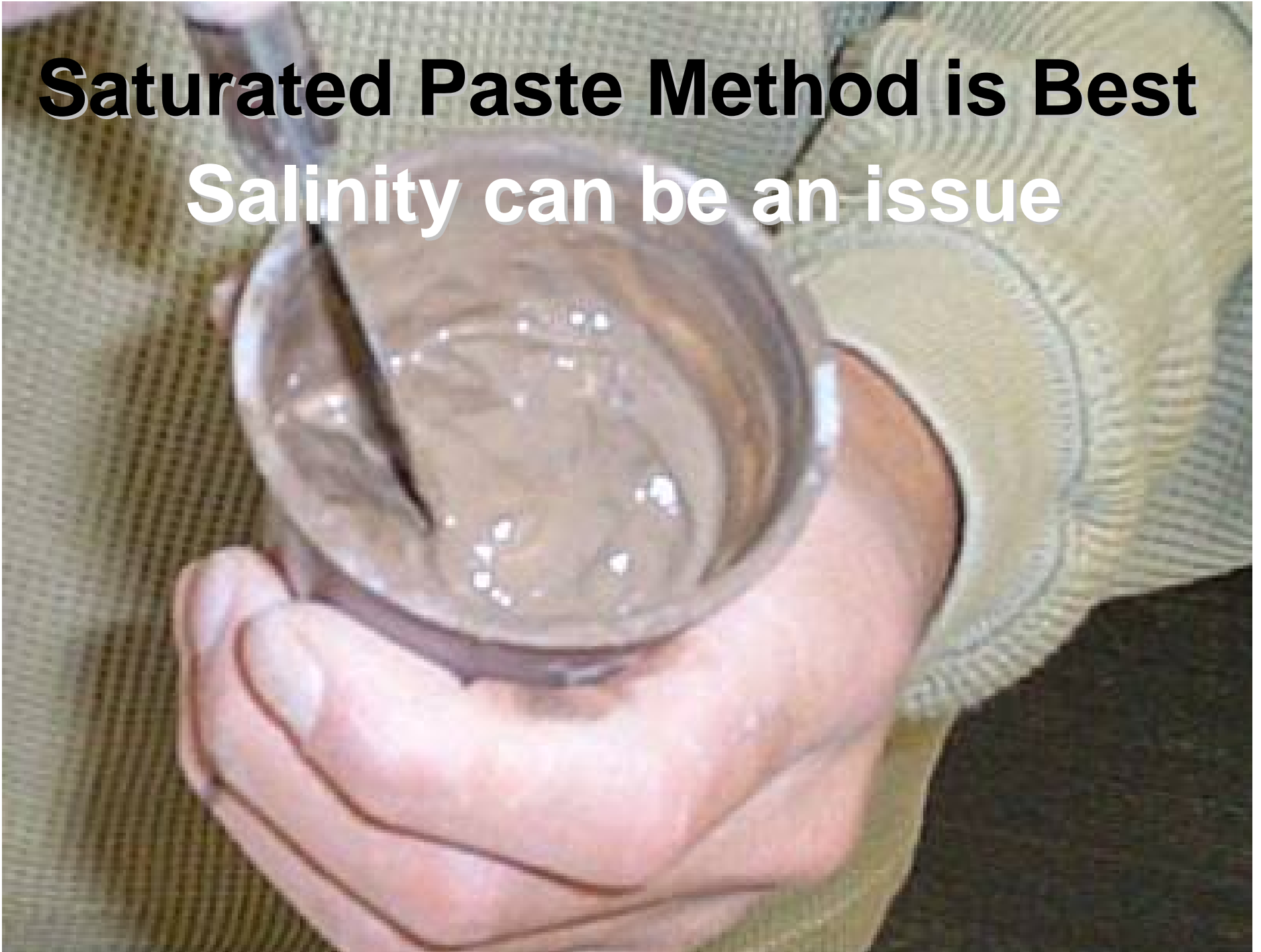
mariposa Pivot

5 row system

SUBSOIL (12-24")



Saturated Paste Method is Best
Salinity can be an issue



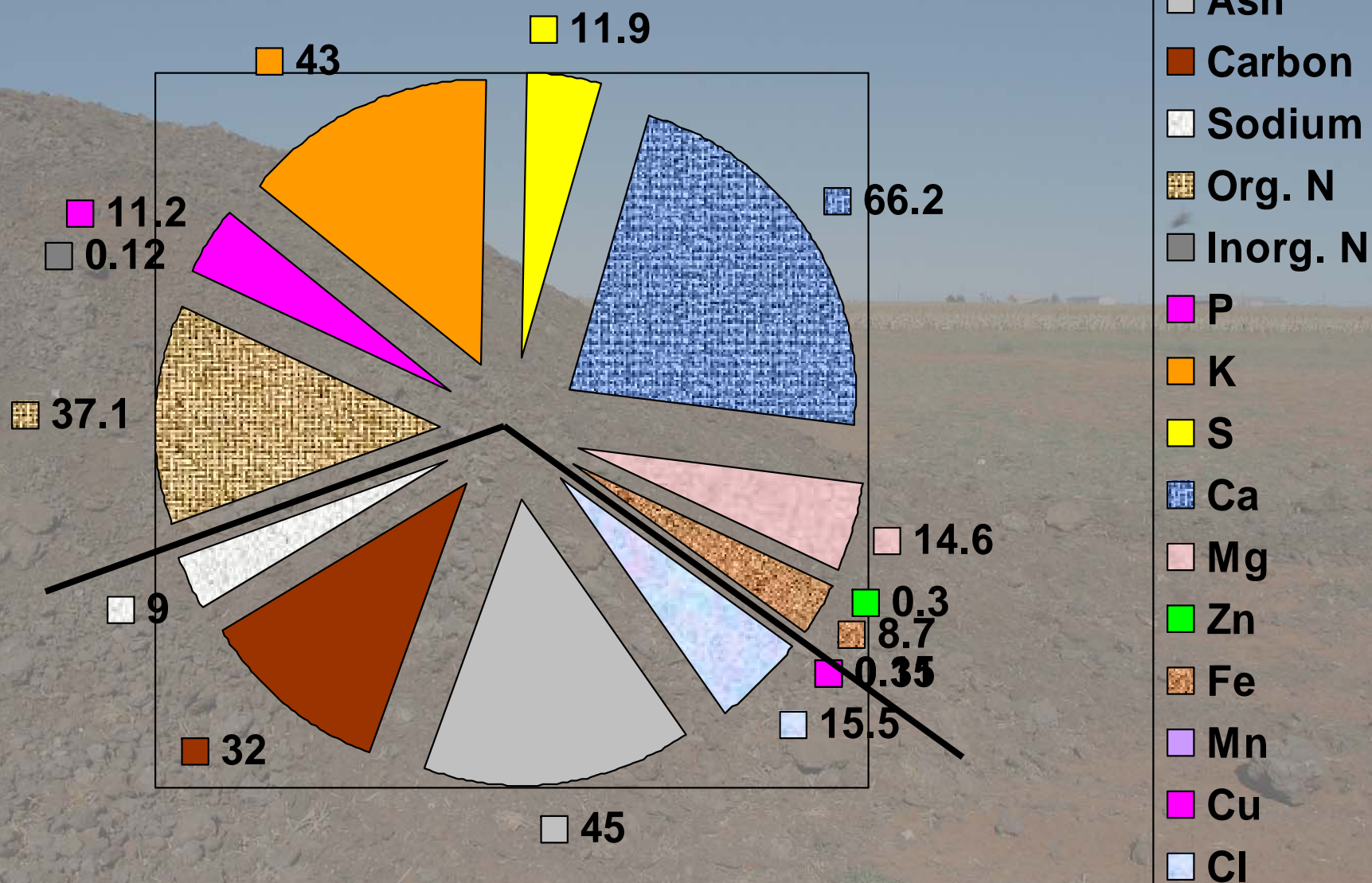
Standard Soil Test should include

- **Topsoil (0-12")**
 - **Salinity Assessment**
 - **Nitrate-N**
 - **Phosphorus (Olsen procedure)**
 - **Potassium (Ammonium Acetate or water)**
 - **Micronutrients**
- **Subsoil (12-24 and 24 – 36)**
 - **Nitrate-N**

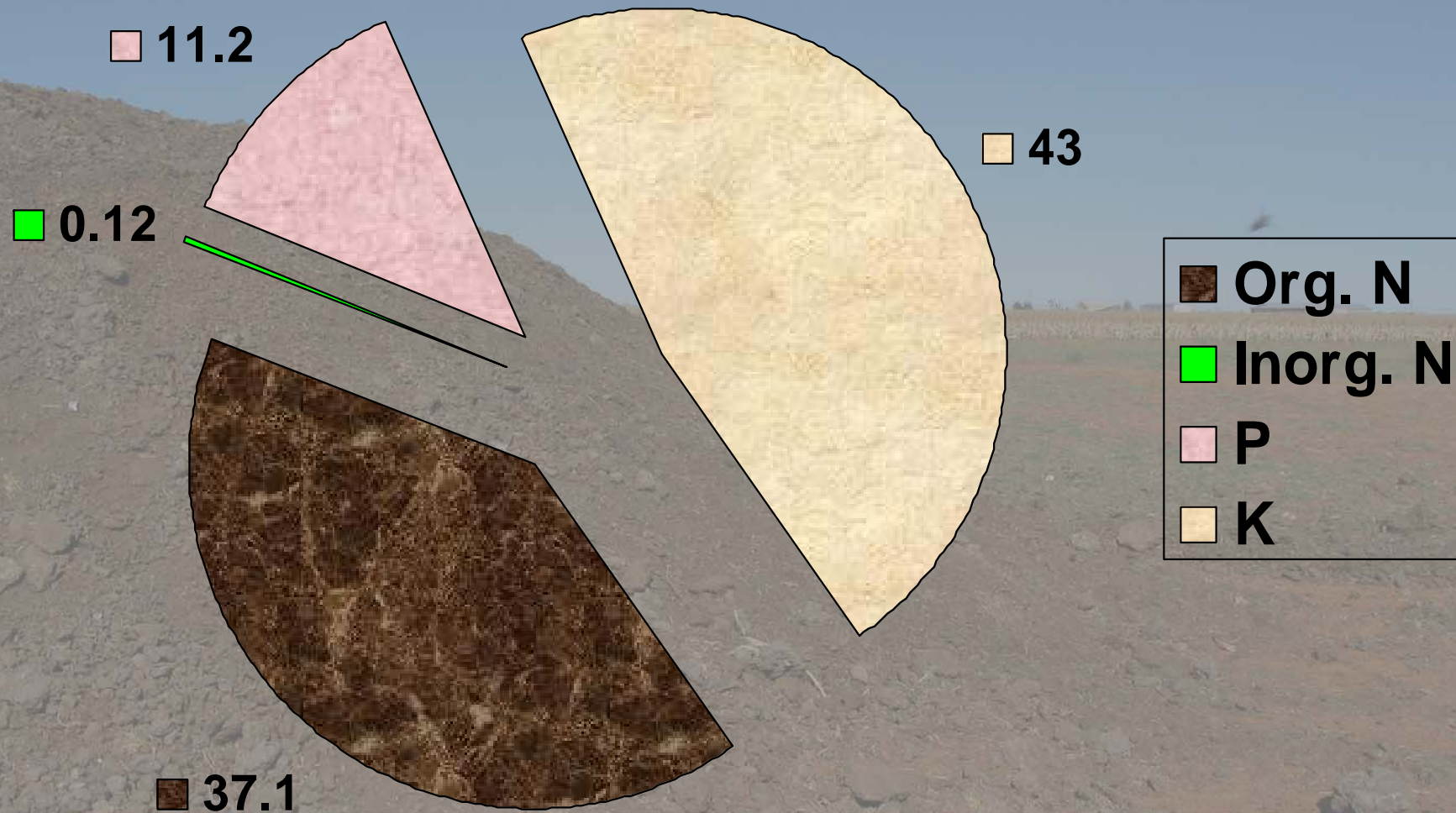
Test the manure!
Be Representative!



Pounds per dry ton



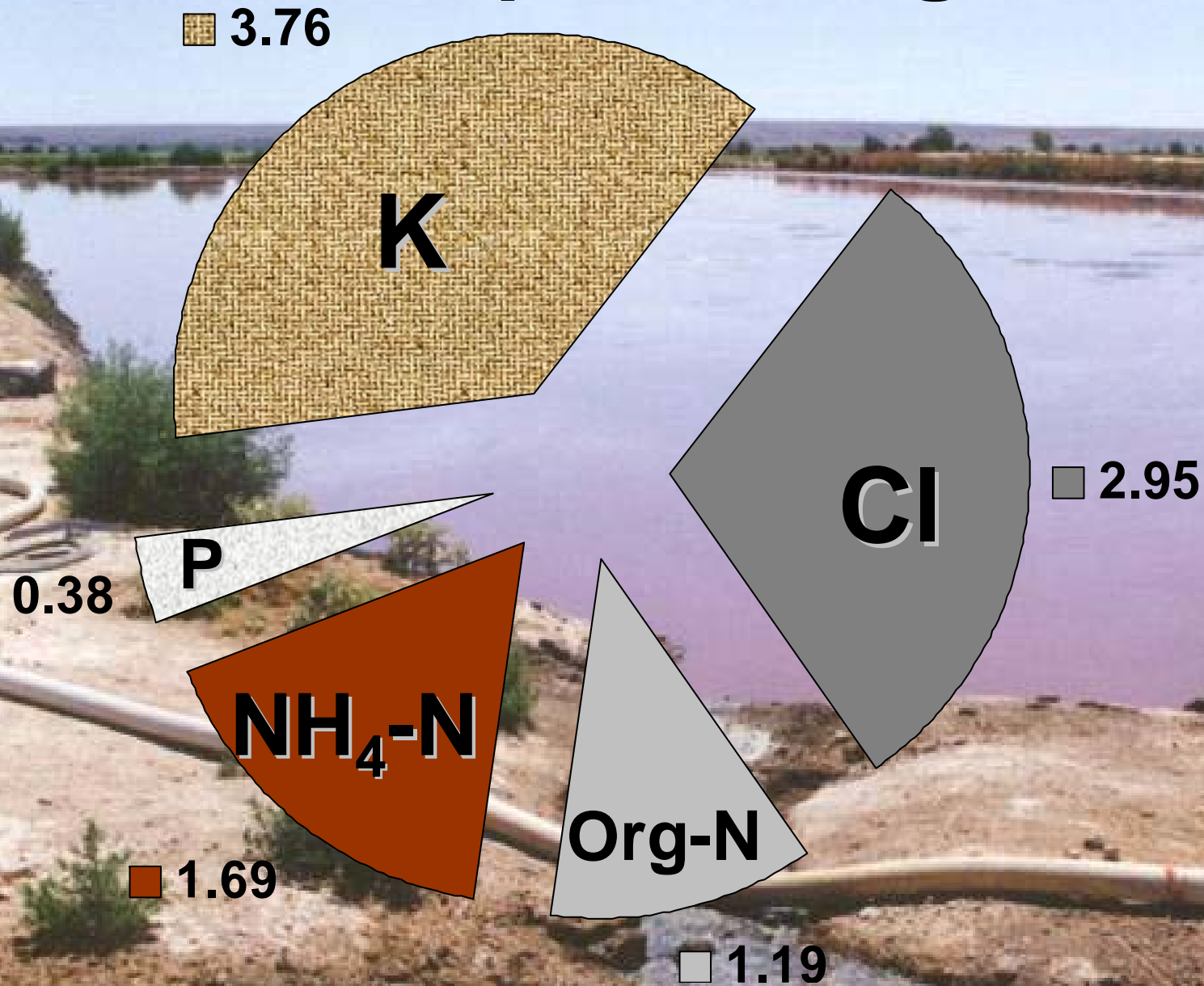
N - P - K



Test the effluent!
Be Representative!



Pounds per 1000 gallons



Pounds per acre-inch

■ 102

K

Cl

■ 80

P

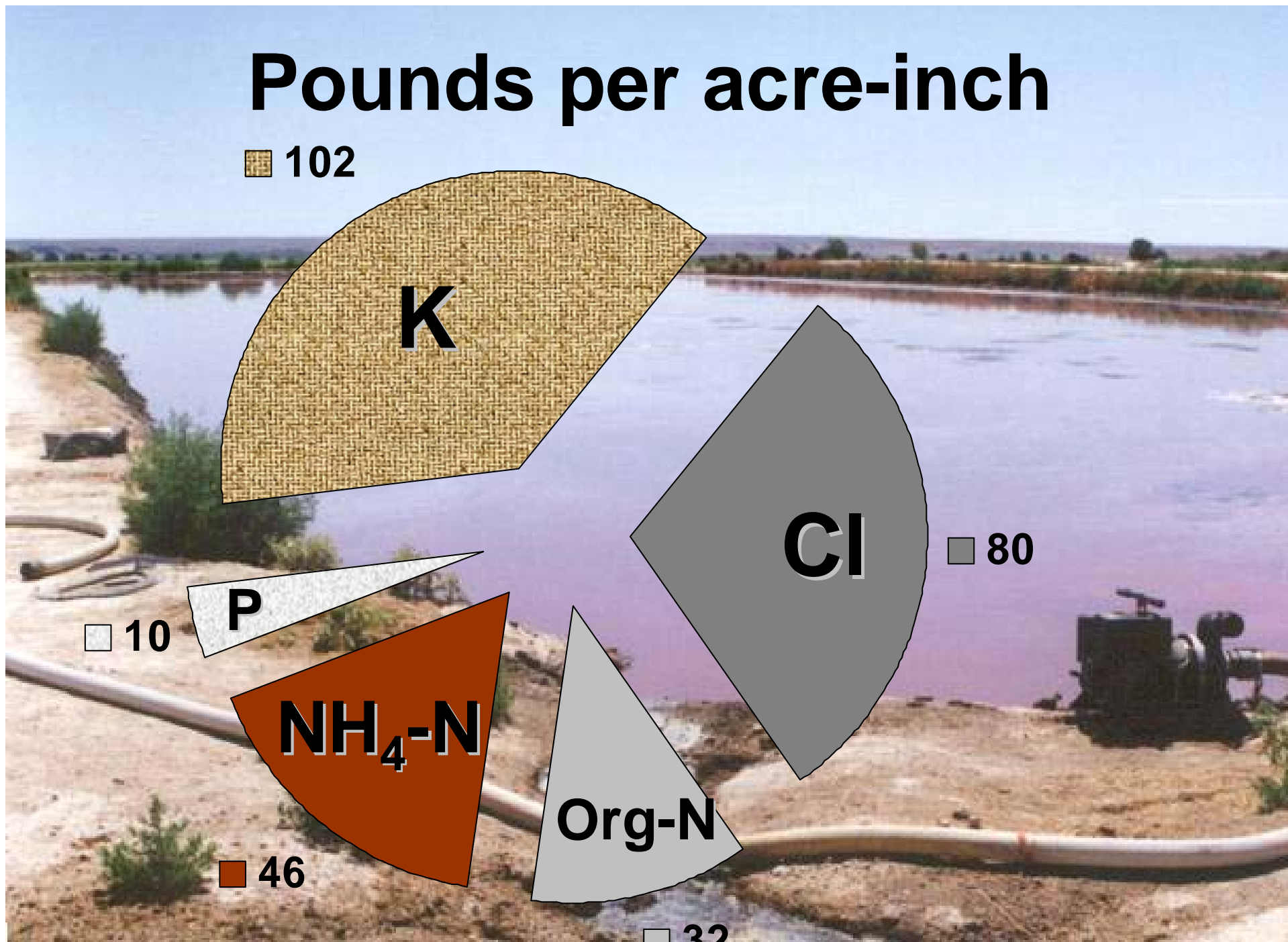
■ 10

NH₄-N

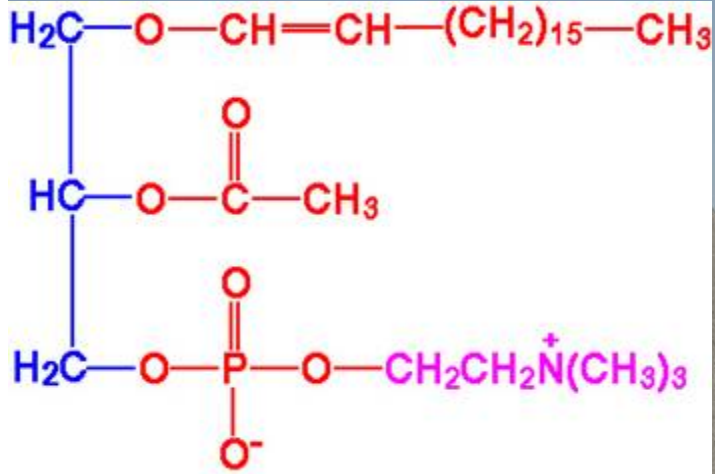
■ 46

Org-N

■ 32




Mineralization



Org-N

Time
Microbes
Moisture
Warm Temperature



$\text{NH}_4\text{-N}$

Soil
Microbes



$\text{NO}_3\text{-N}$

Water Quality

- **Electrical Conductivity**
 - 4.8 mmhos/cm
- **pH**
 - 7.8
- **Solids**
 - 0.4 % by volume
- **Total Dissolved Solids**
 - 2903 ppm
- **Chloride**
 - 353 ppm

- **Irrigation purposes**
 - < 3 mmhos/cm
- **pH**
 - < 8
- **TDS**
 - <2000
- **Chloride**
 - <69 ppm

Selecting the right crop

- Capable of removing nitrogen
 - Yield and Protein
- Tolerant of salinity if a concern
- Tolerant of drought if limited water

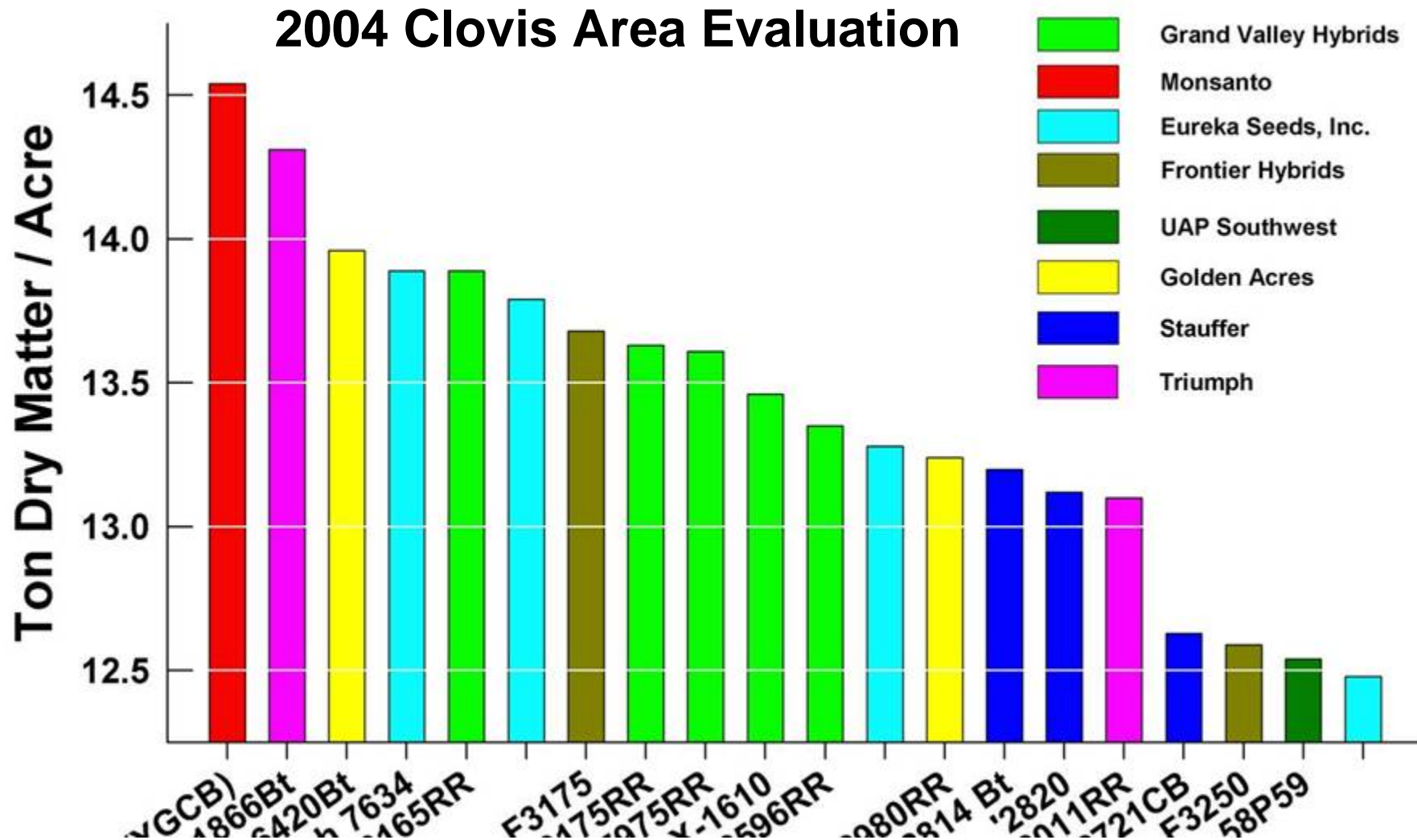
Selecting the right crop

- Nitrogen Removal – an NMED “biggie”
 - $\text{Yield (T/A)} \times \text{Nitrogen Content (lb/T)} = \text{lb N/A}$
- Annual Crops
 - Corn for silage
 - Winter grain for silage
 - Forage Sorghum
 - Forage Sudan
 - Sudangrass



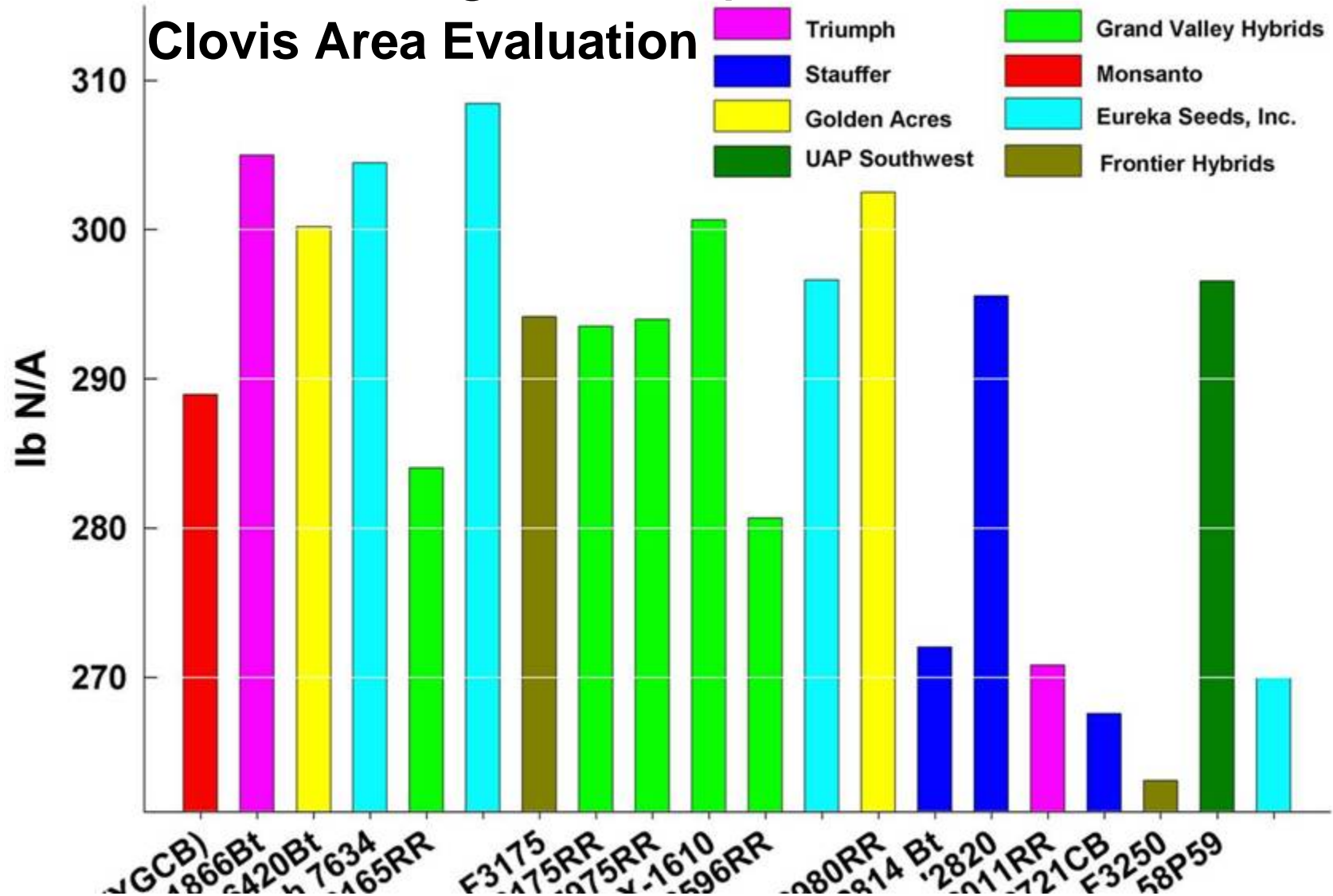
Selecting the right crop

➤ Corn for Silage – Variety Choice



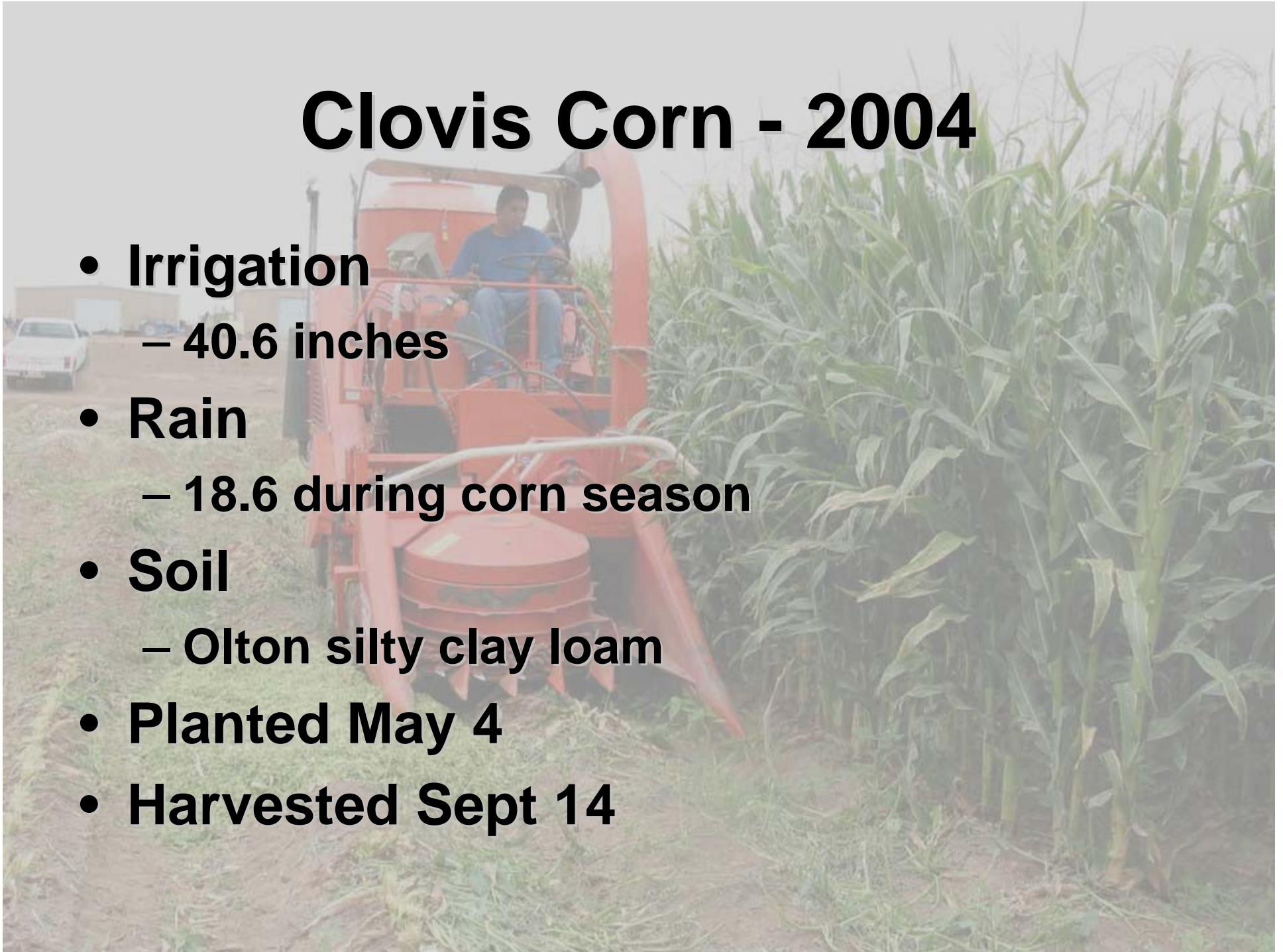
Selecting the right crop

➤ Corn for Silage – N Uptake



Clovis Corn - 2004

- **Irrigation**
 - 40.6 inches
- **Rain**
 - 18.6 during corn season
- **Soil**
 - Olton silty clay loam
- **Planted May 4**
- **Harvested Sept 14**

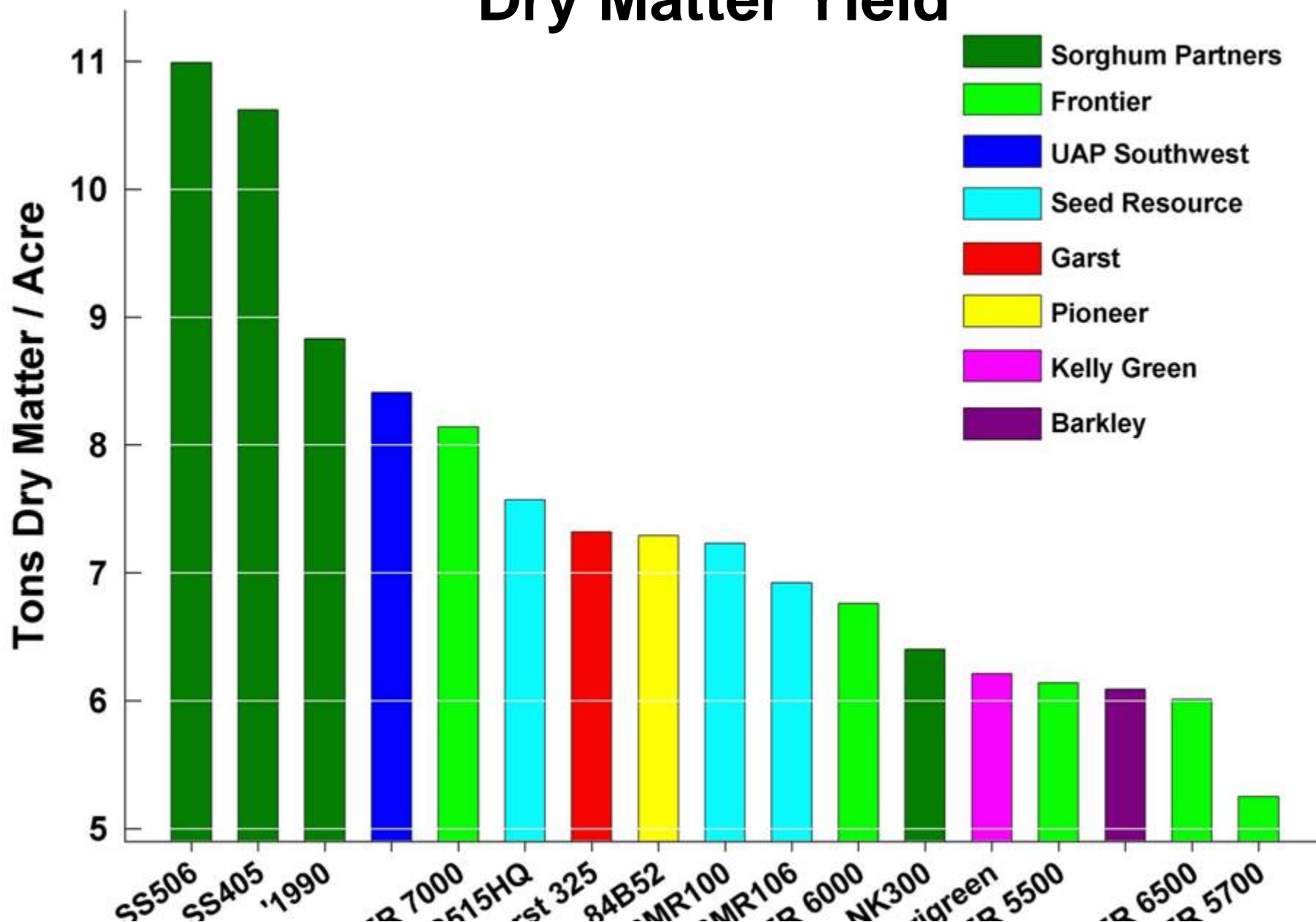


Selecting the right crop

➤ Forage Sorghum – Variety Choice

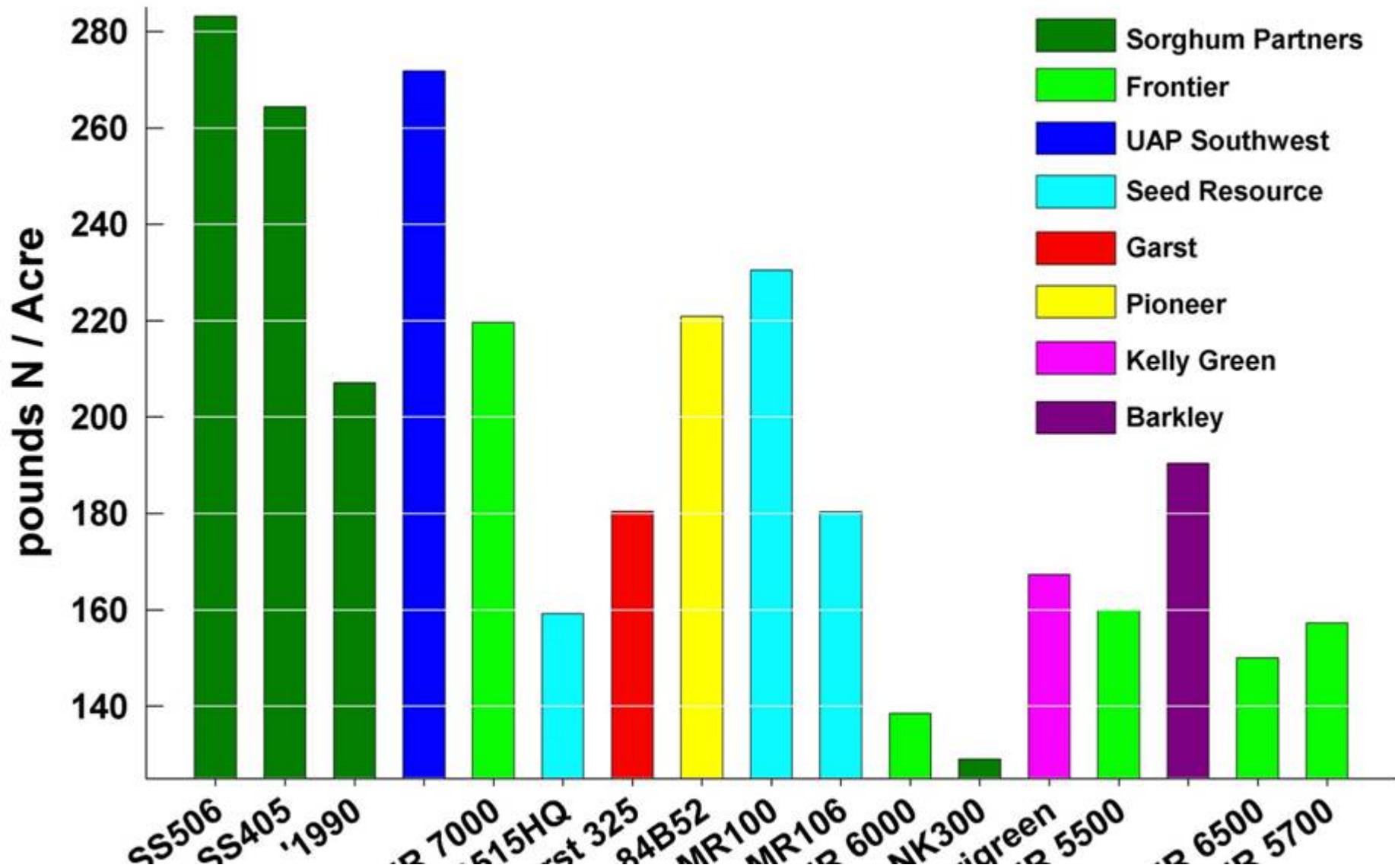


Clovis Forage Sorghum, 2004 Dry Matter Yield



Clovis Forage Sorghum, 2004

Nitrogen Uptake

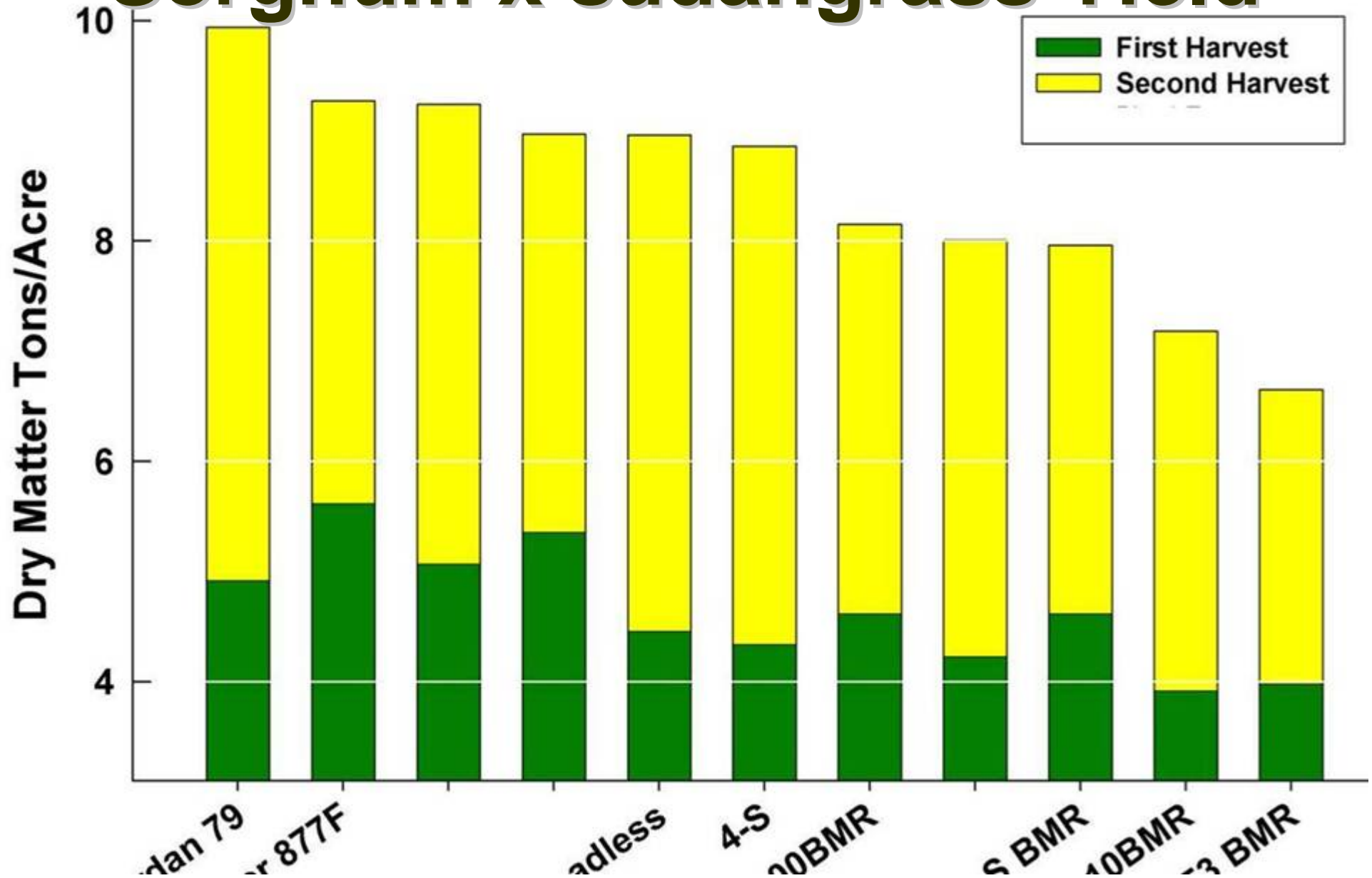


A photograph of a lush green sorghum field. The plants are tall and dense, with long, narrow leaves. The sky is a clear, pale blue. The title text is overlaid on the top half of the image.

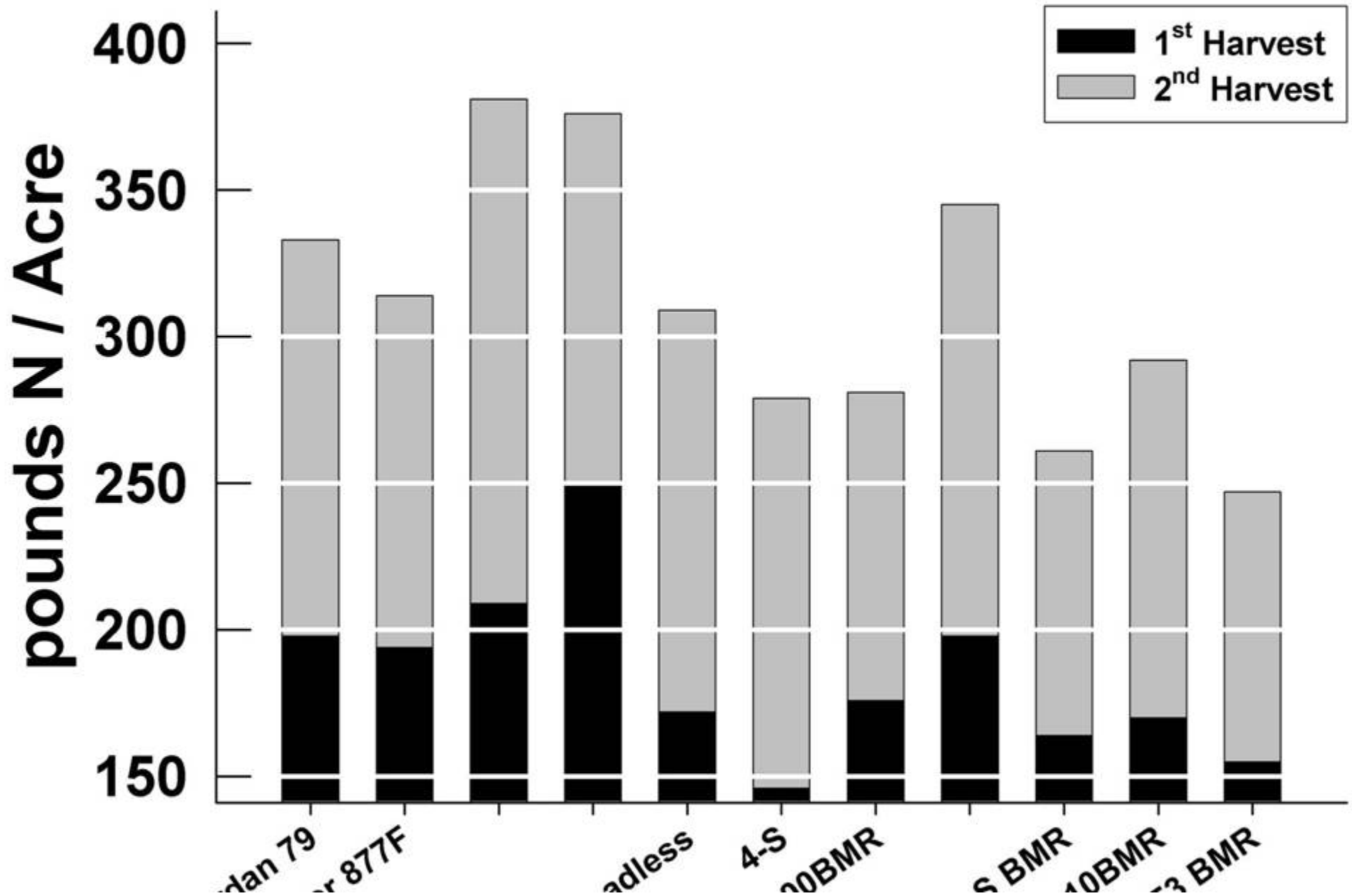
Clovis Forage Sorghum Agronomics

- **Irrigation**
 - 11.5 inches
- **Rain**
 - 15.9 during season
- **Soil**
 - Olton silty clay loam
- **Planted May 13**
- **Harvested August 27**

Sorghum x sudangrass Yield



Sorghum x sudangrass N Uptake



Sudangrass Methods

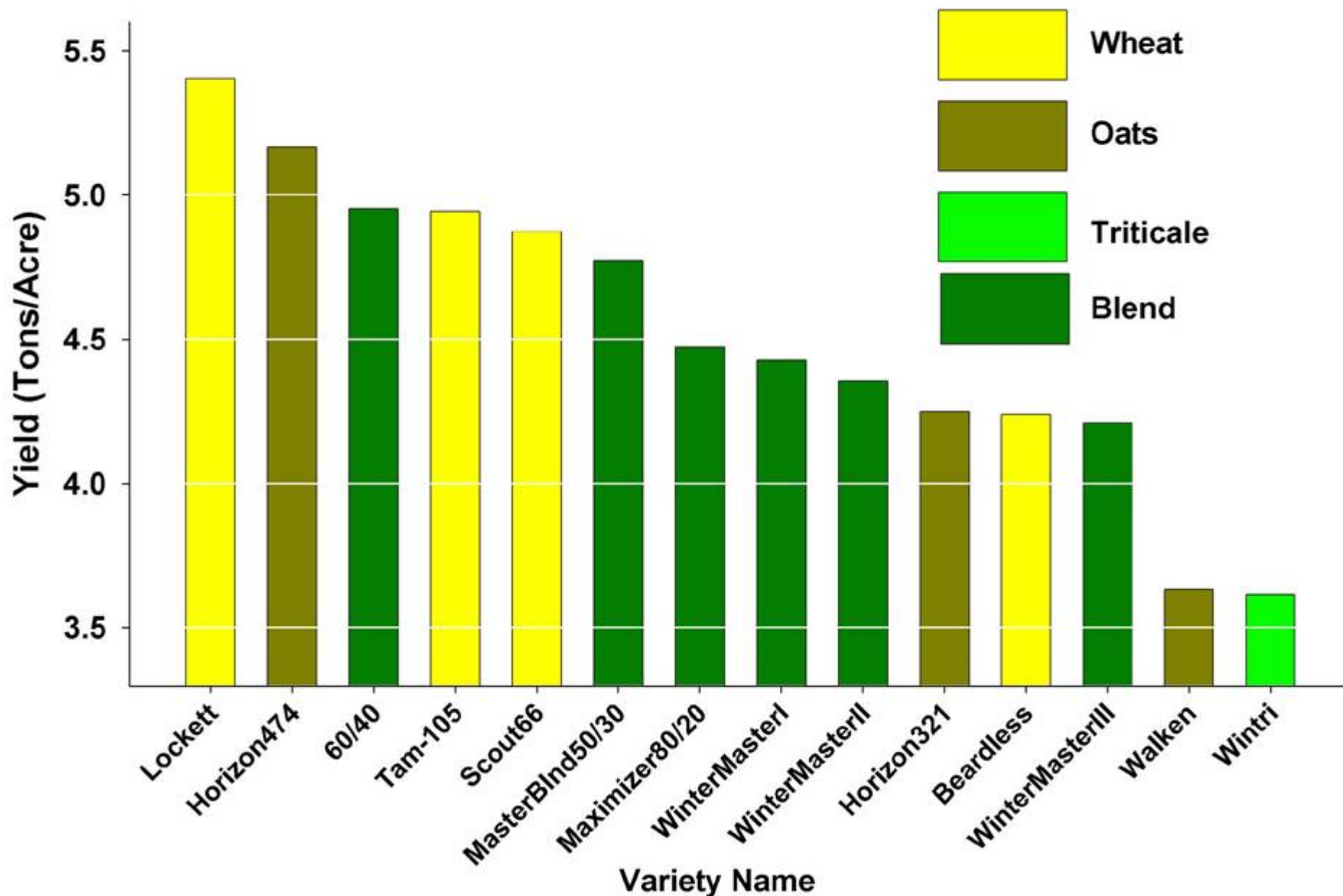
- **Irrigation**
 - 11.5 inches
- **Rain**
 - 25.3 during season
- **Soil**
 - Olton silty clay loam
- **Planted May 13**
- **Harvested July 28, October 21**

Small grains



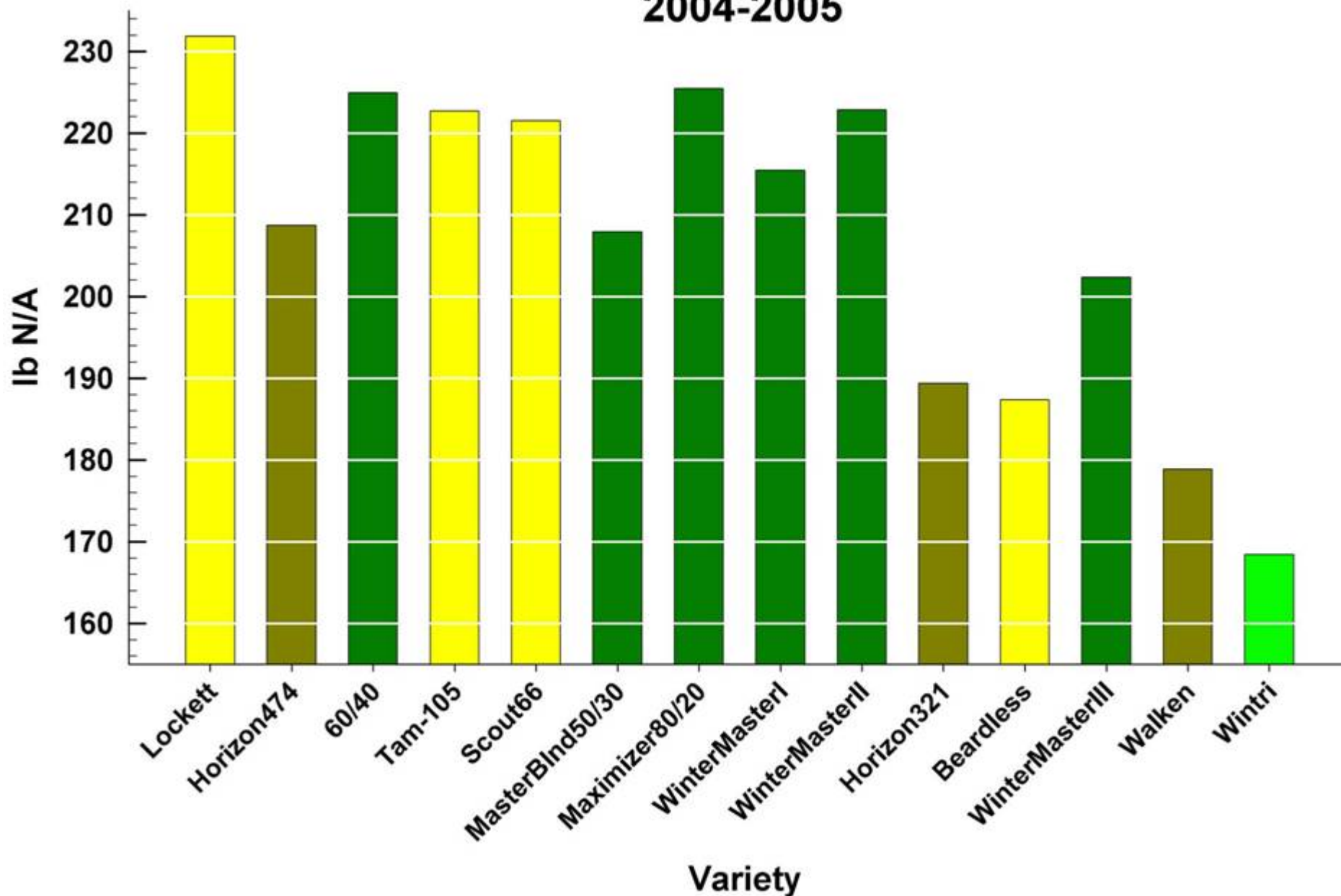
Artesia

Winter Forage Dry Matter Yield
2004/2005



Artesia

Winter Forage N Removal 2004-2005

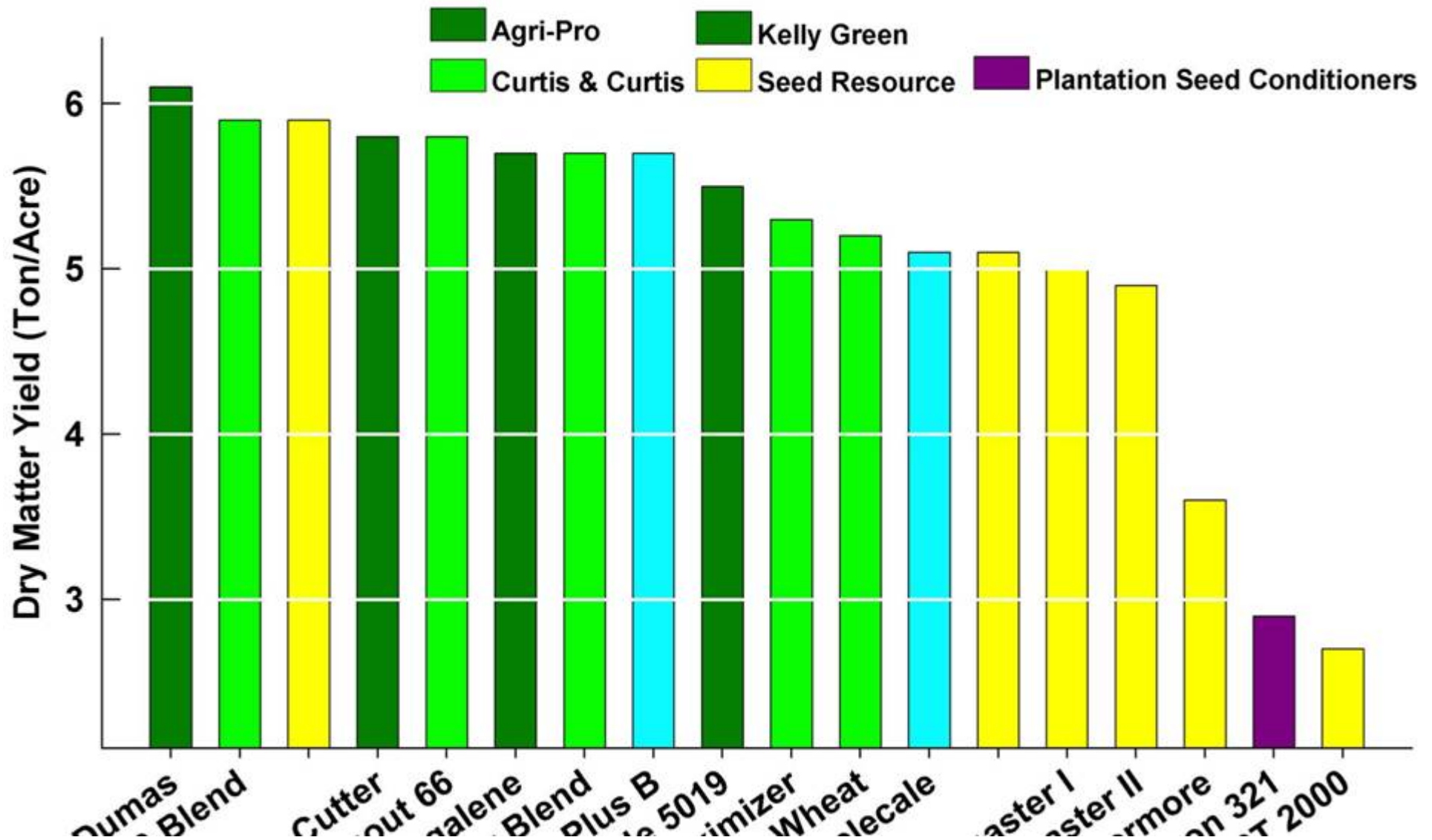




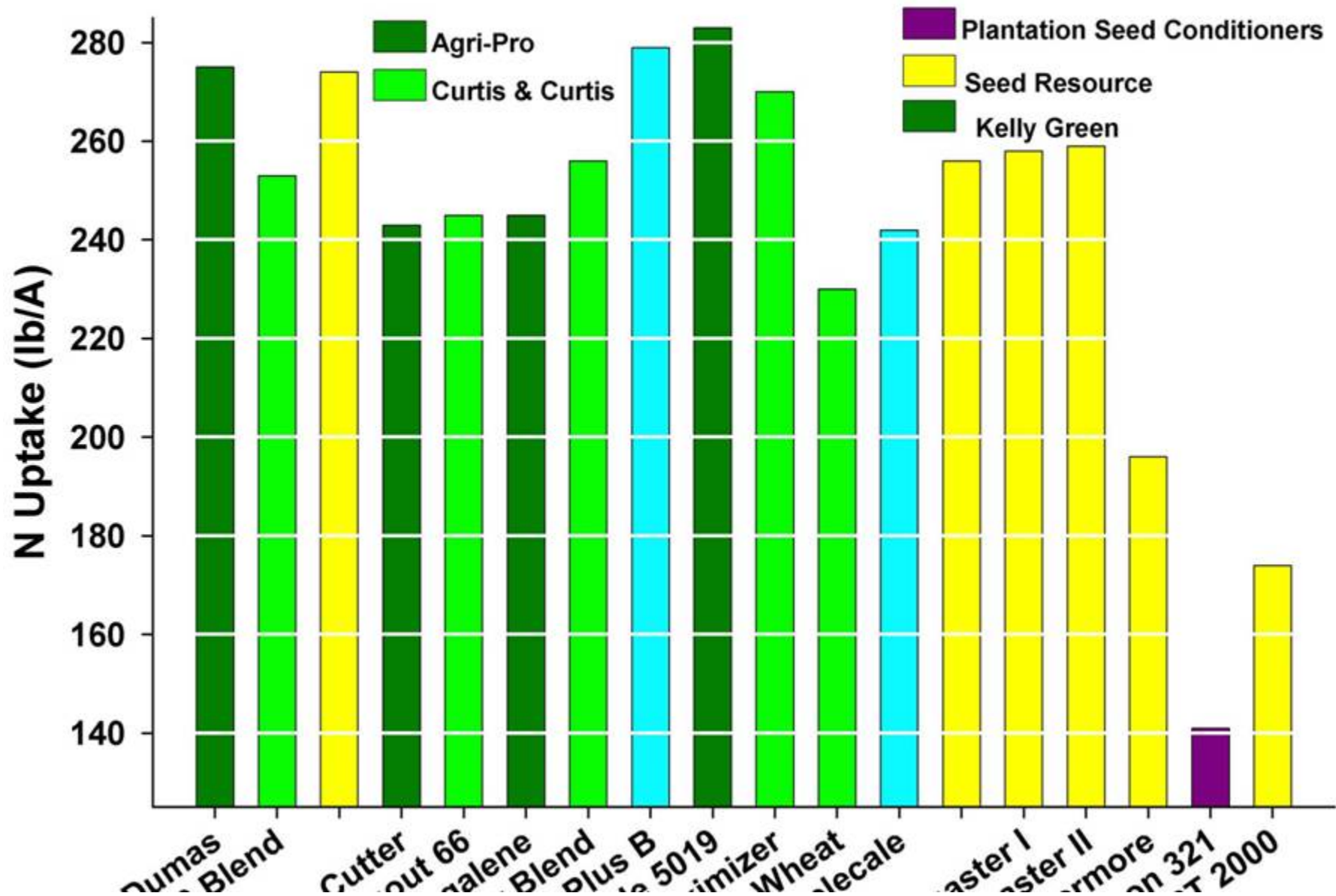
Winter grain Artesia Methods

- **Planting Date**
 - October 19
- **Harvest Date**
 - April 12
- **Rain**
 - 11.5
- **Irrigation**
 - 3.2

Small grain yields - Clovis



Small grain yields - Clovis





Winter grain Clovis Methods

- **Planting Date**
 - Sept 13
- **Harvest Date (growth stage dependent)**
 - March 3 to April 26
- **Rain**
 - 16-inches
- **Irrigation**
 - 10-inches

Selecting the Right Crop

Double Cropping

Warm-season

followed by

Cool-season



Double Cropping

- | | |
|--|---|
| <ul style="list-style-type: none">• Corn + Small Grain• Irrigation
$40 + 10 = 50$-inches
+ Rain ($18.6 + 16$) | <ul style="list-style-type: none">• Sorghum + Small Grain• Irrigation
$11.5 + 10 = 27.5$-inches
+ Rain ($15.9 + 16$) |
| <ul style="list-style-type: none">☐ Nitrogen Removal
☐ $289 + 243 = 532$ | <ul style="list-style-type: none">☐ Nitrogen Removal
☐ $194 + 243 = 437$ |
| <ul style="list-style-type: none">➤ Dry Matter (Ton/A)
➤ $13.4 + 5.1 = 18.5$ | <ul style="list-style-type: none">➤ Dry Matter (Ton/A)
➤ $7.4 + 5.1 = 12.5$ |

Double Cropping

- Sudan + Small Grain
- Irrigation
 $11.5 + 10 = 21.5\text{-inches}$
+ Rain ($25.3 + 16$)

☐ Nitrogen Removal

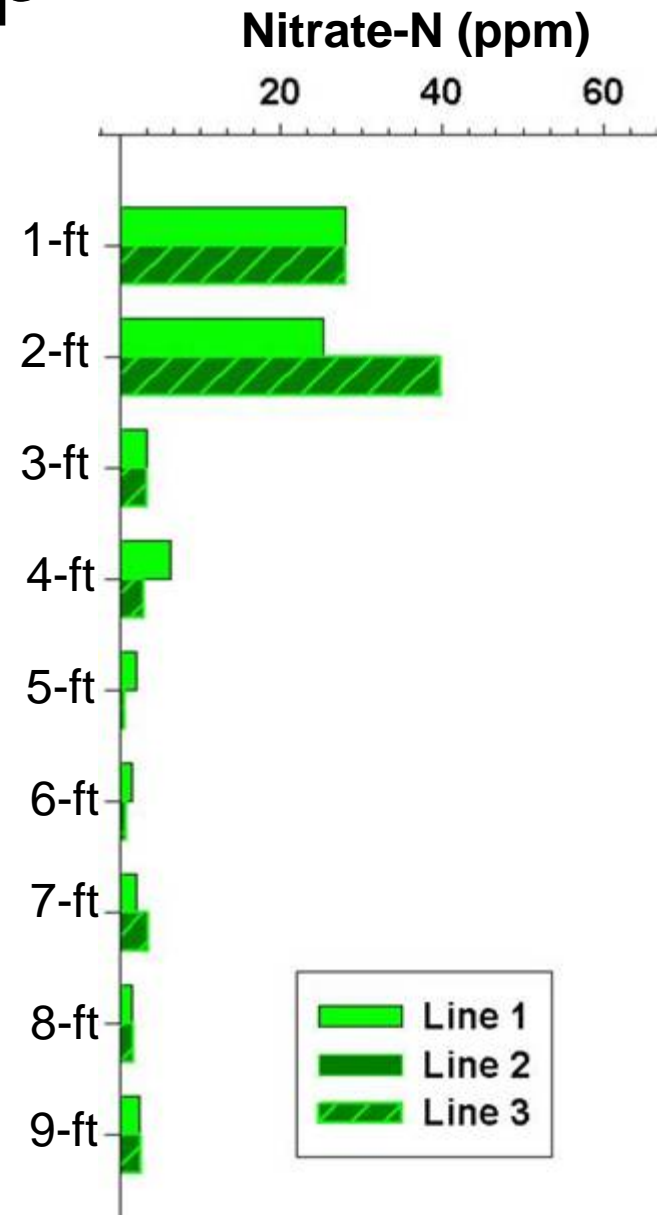
☐ $311 + 243 = 554$

➤ Dry Matter (Ton/A)

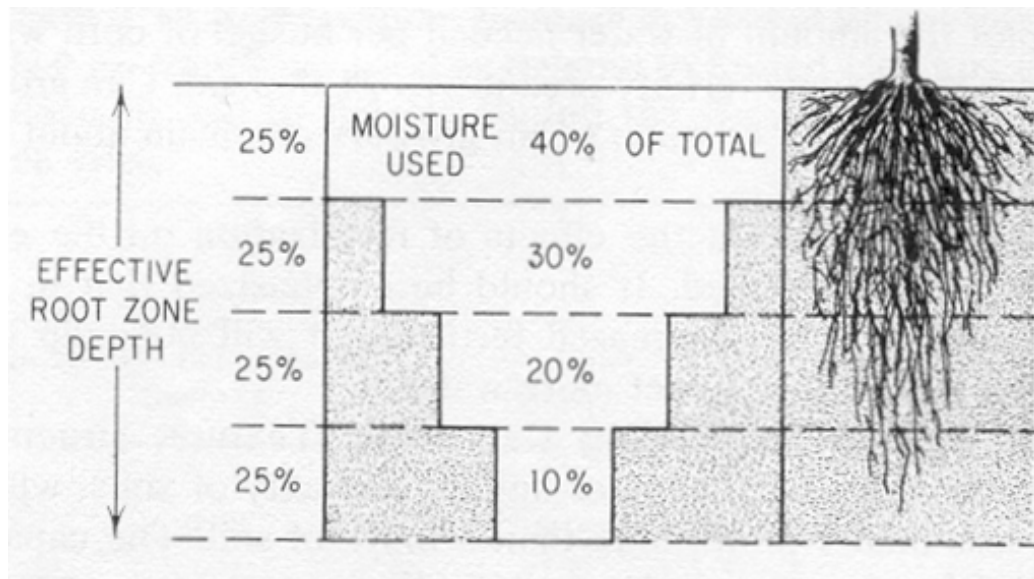
➤ $8.4 + 5.1 = 13.5$

Selecting the right crop

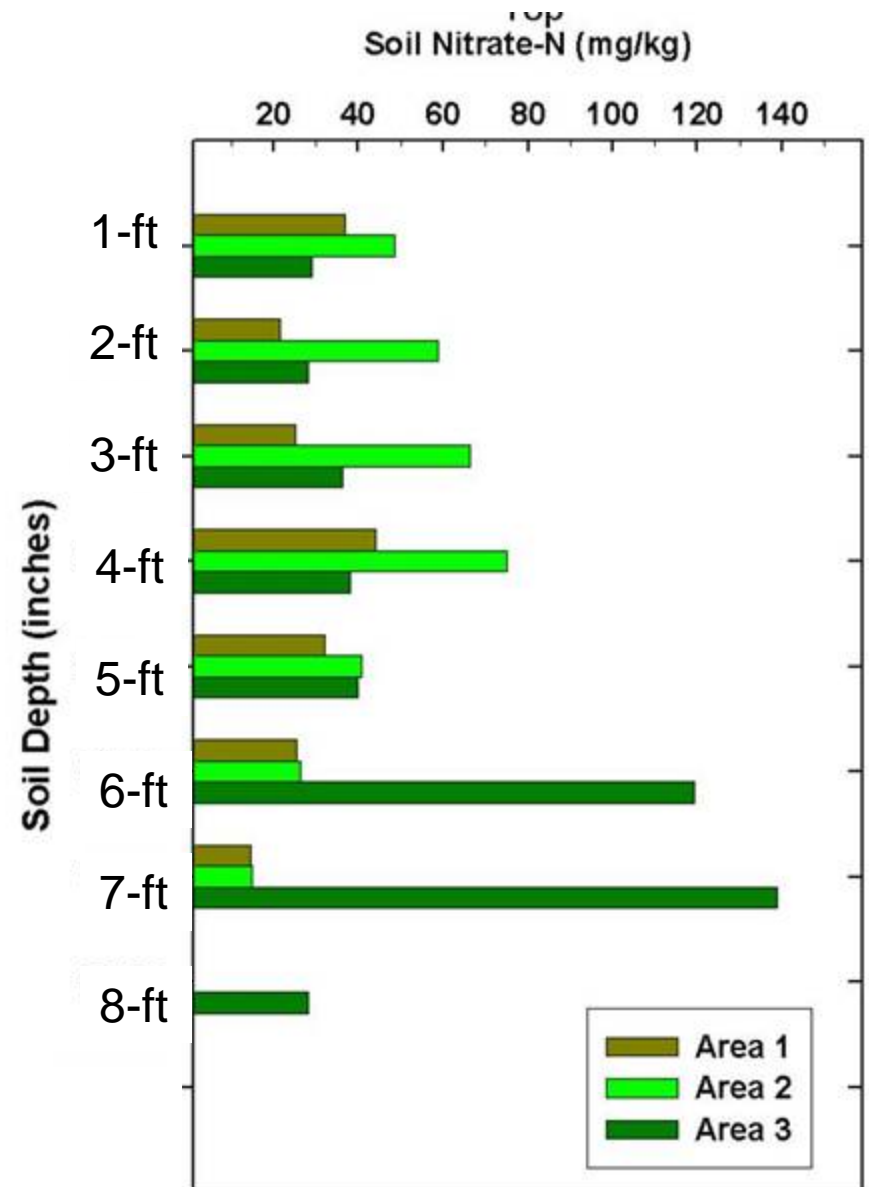
- Timing Nitrogen Removal
- Prevent nitrate movement from beyond the root zone.



Even high N uptake crops can result in nitrate-N movement from beyond the effective root zone



Why?



...not soil testing

257 lb N/A removed

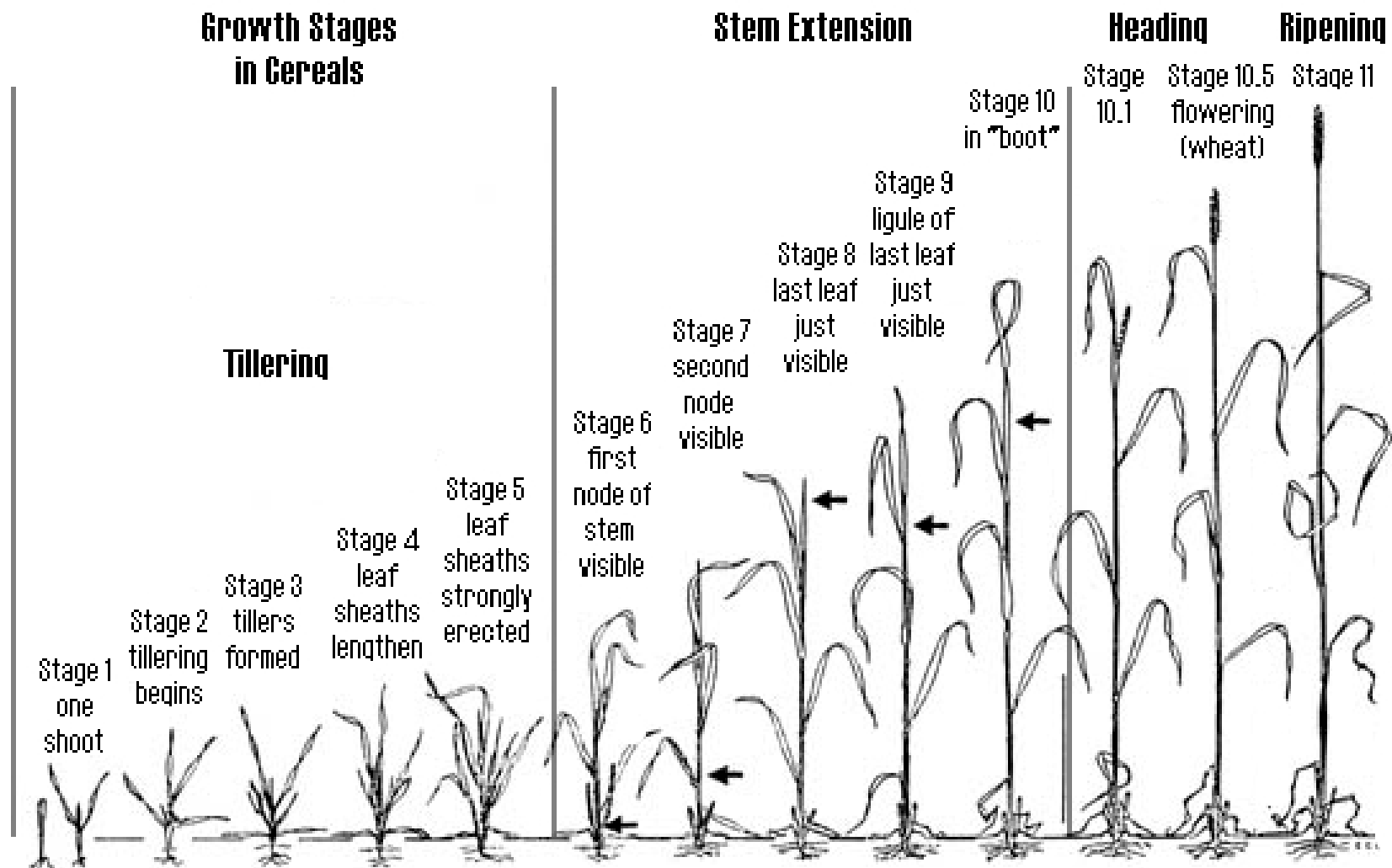
8.6 Ton Manure

SOIL

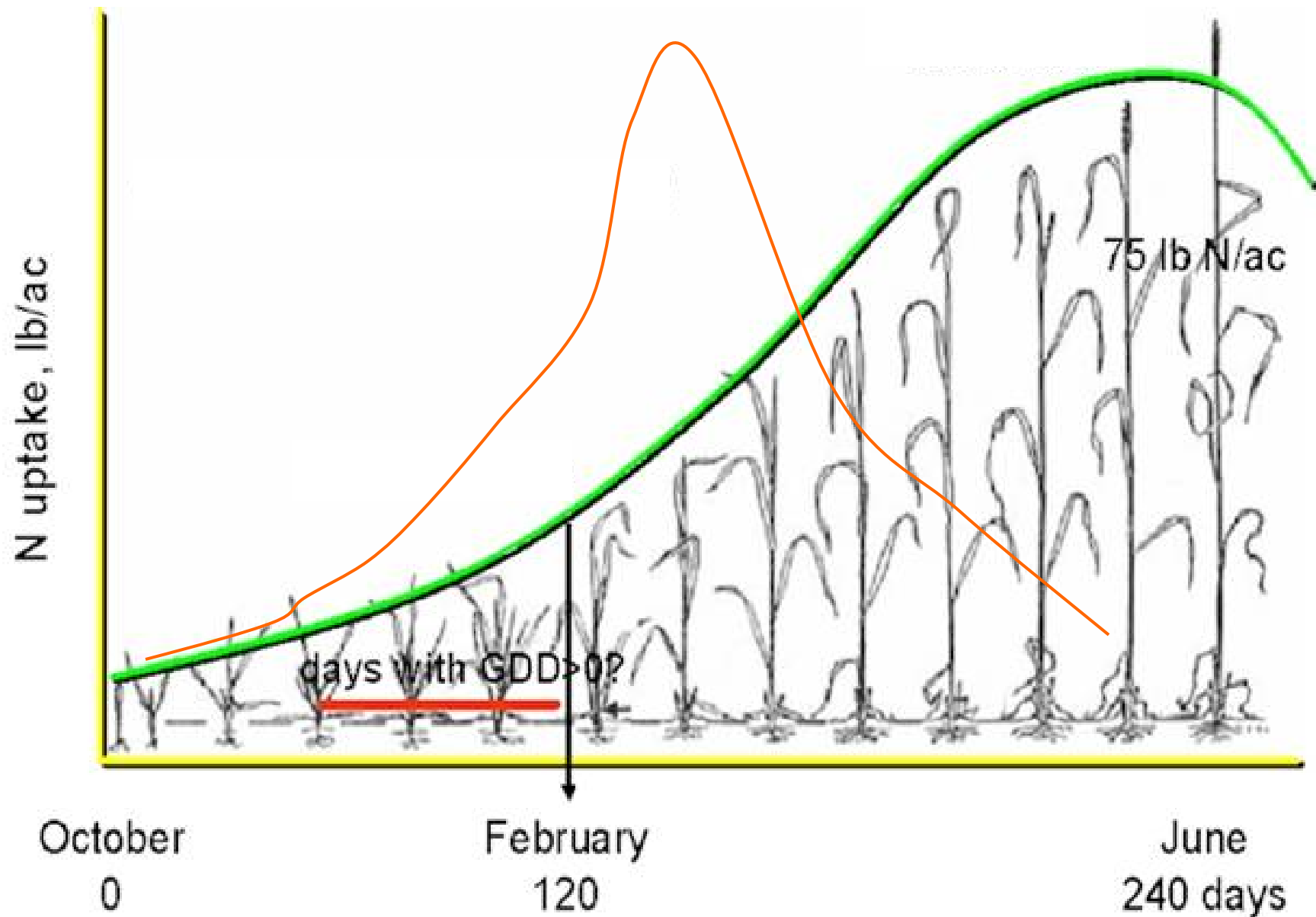
O.M. 0.9%

36 ppm NO₃-N

Timing applications



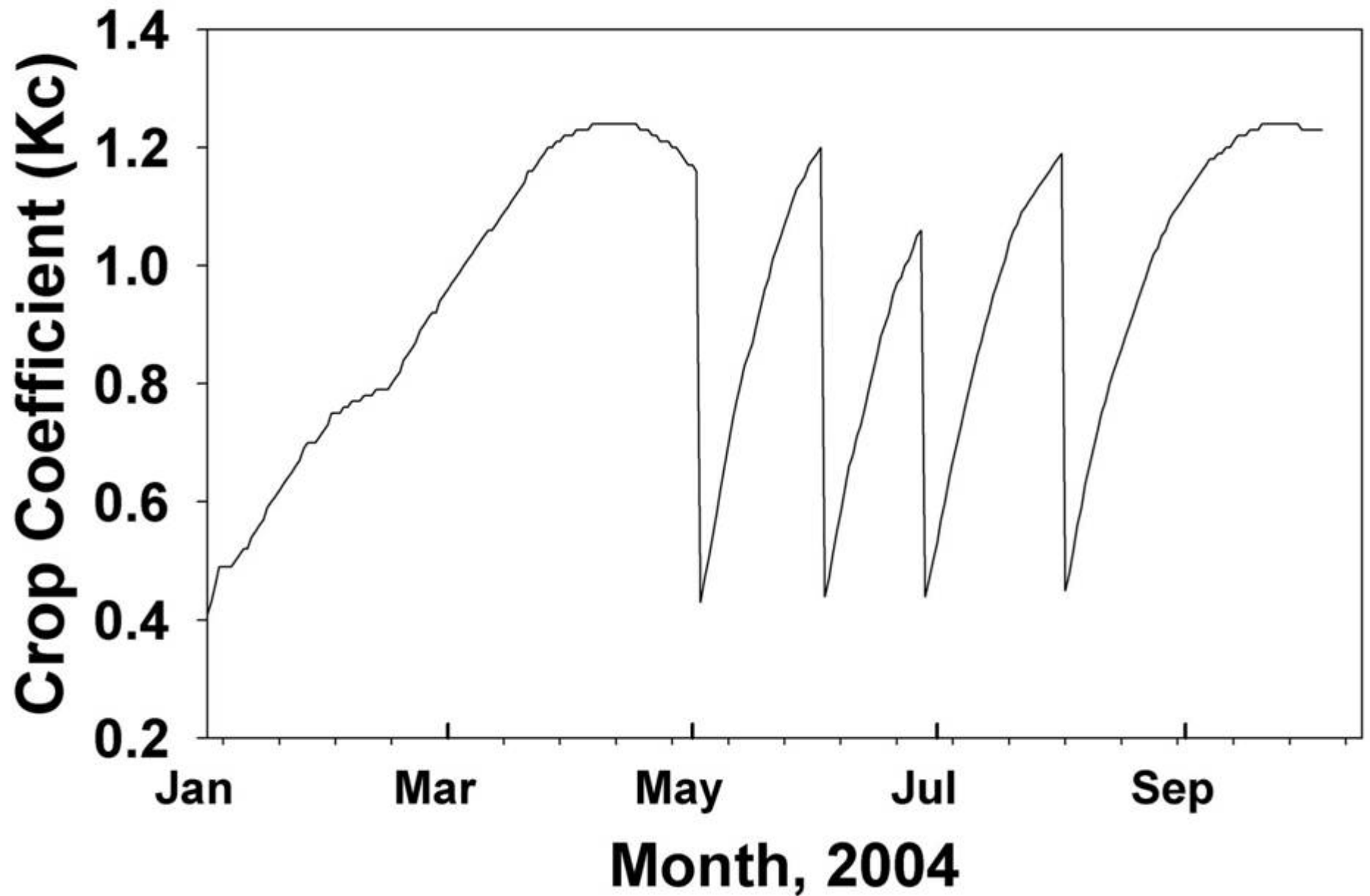
Uptake vs Rate of Uptake



Consider Perennial Crops



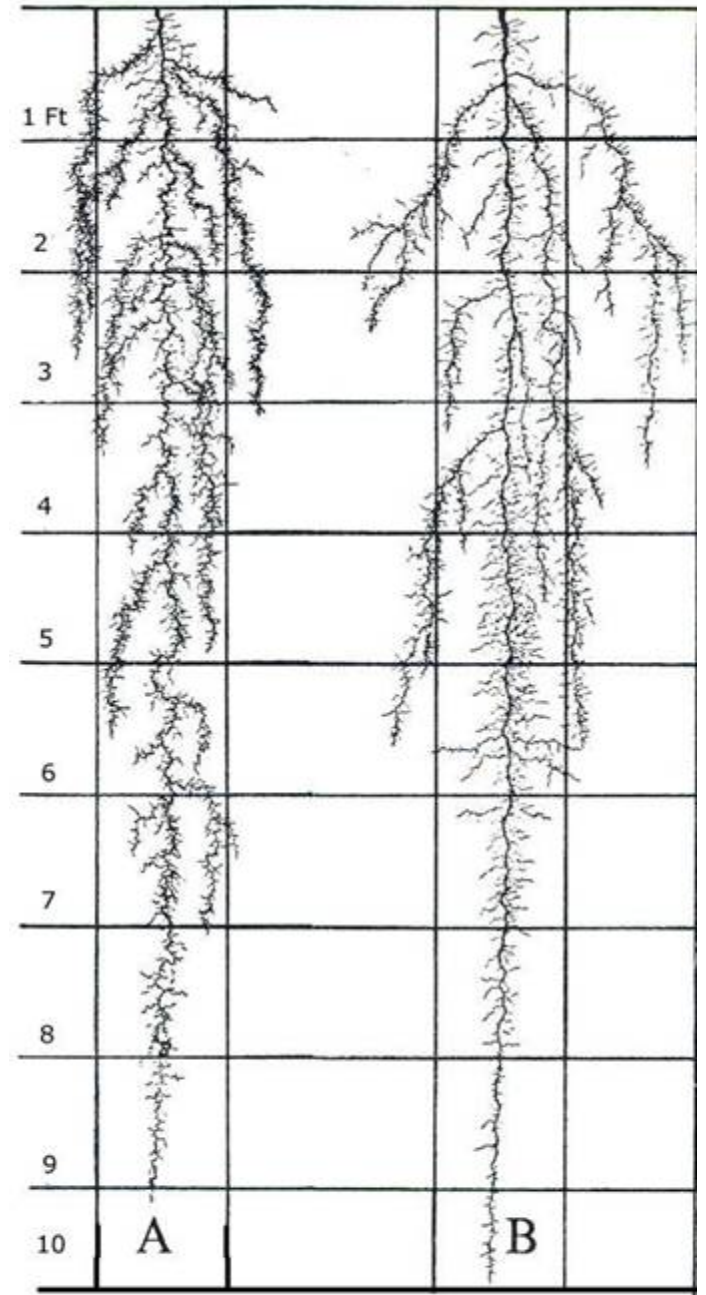
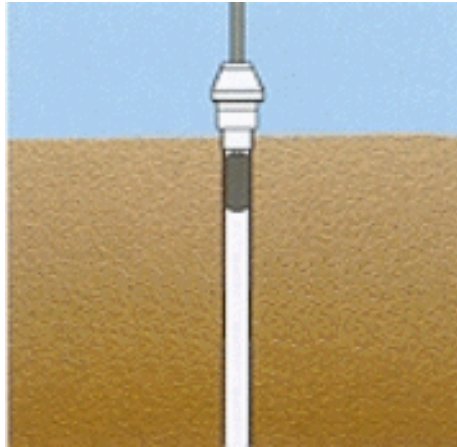
Alfalfa Crop Coefficient, 2004



Role of Perennial Crops

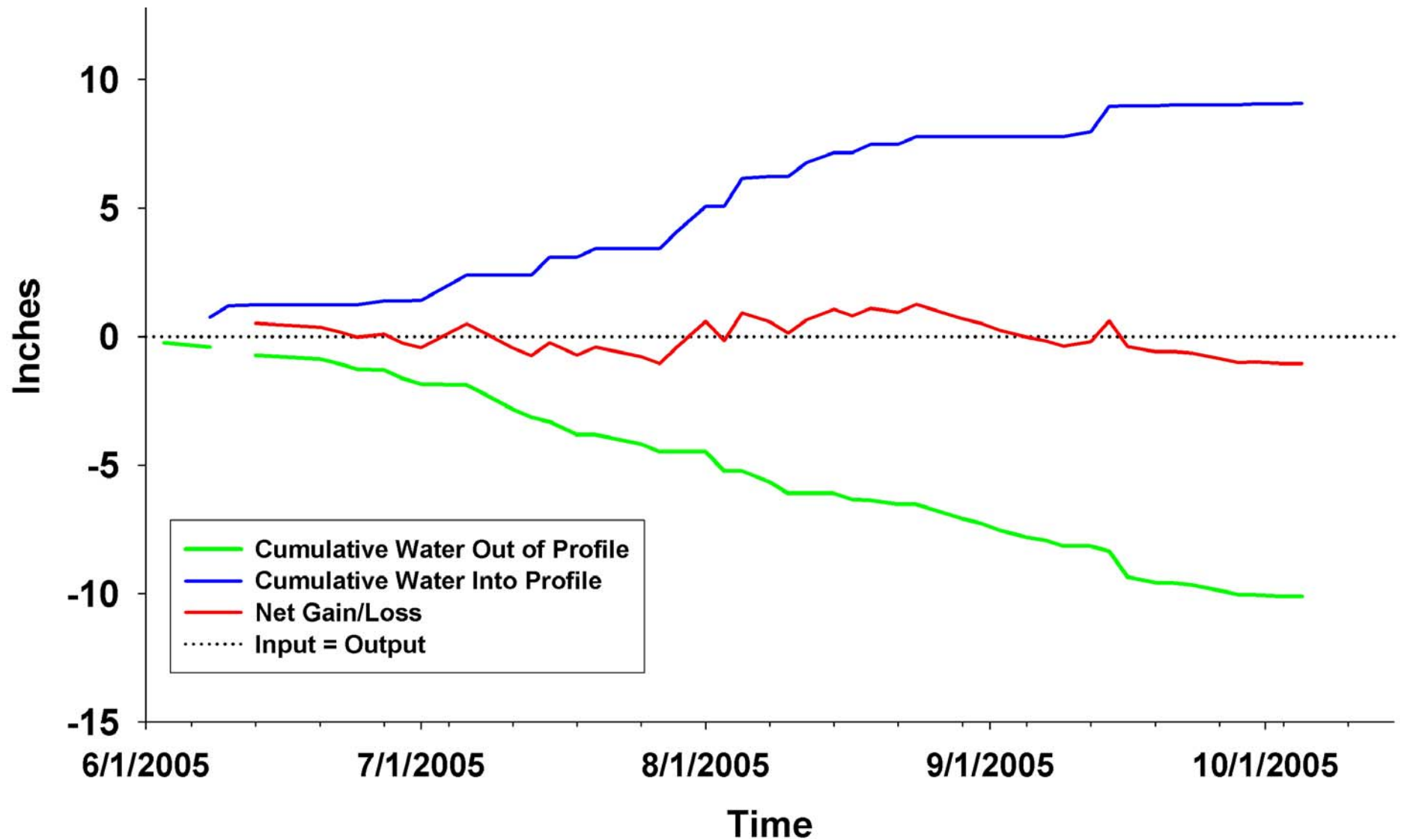
- Alfalfa
- Wheatgrass
- Bermudagrass
- Fescue
- Long-season
- Established Root Systems
- High N requirement

Irrigate When Needed

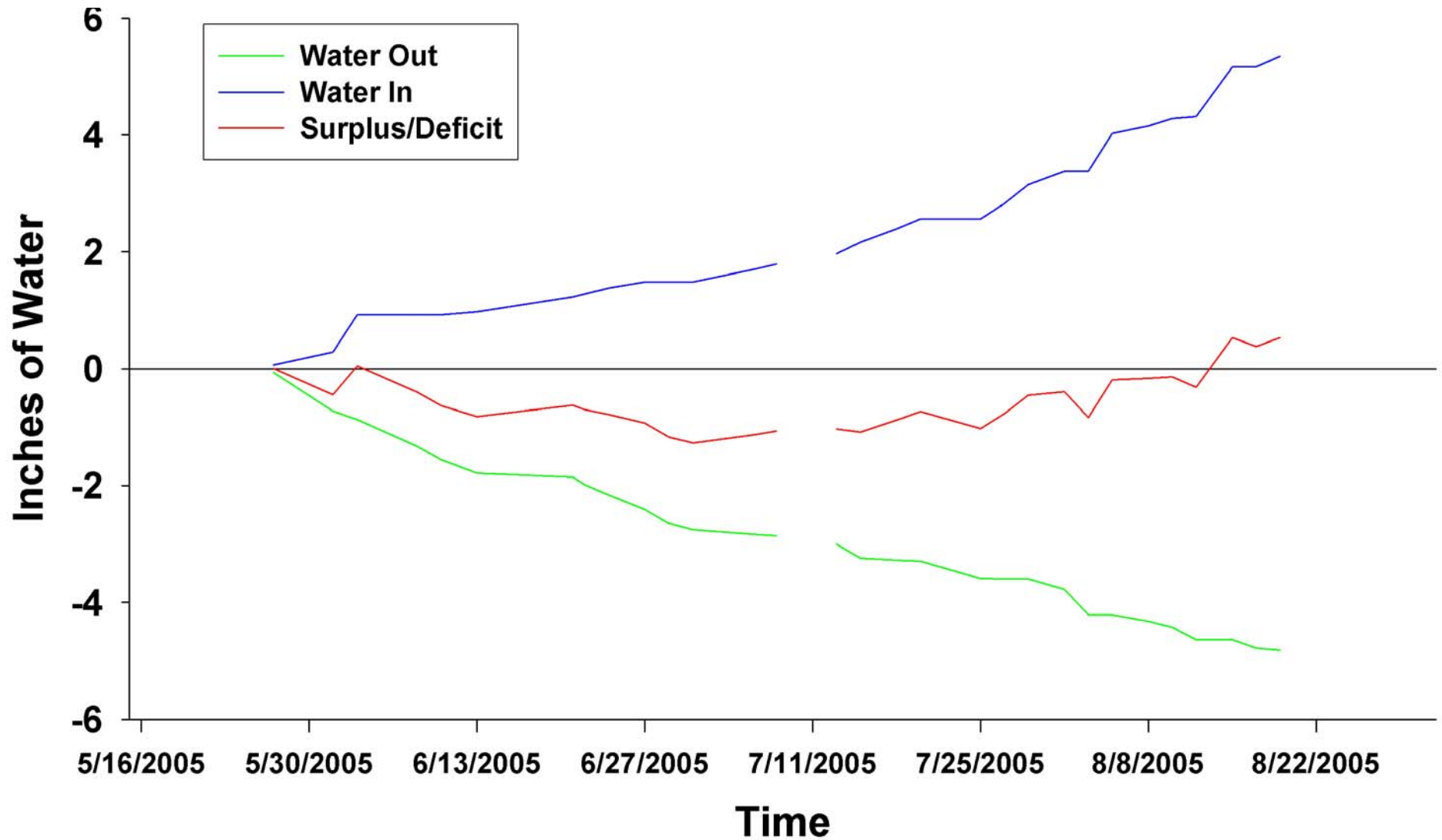


Alfalfa

Cotton, 2005, pivot



Corn, 2005, pivot



Watch for:

Disease

Irrigation

Insects



What do we need to know?

– Positive

- Plant Nutrients
- Organic Matter
- Best Varieties



– Negative

- Salinity
- Sodium
- Leaching

